4 meters in length were tied to each corner of the nylon rod frame and the free ends of these lines were then tied together and in turn tied to a ballast weight of about 4 kilograms. The ballast weight in turn was tied to a towing line of nylon rope about 200 meters in length. This tow rope was wound on a drum coupled to a winch by a clutch and carried in a compartment within an aircraft. While the aircraft was flying at an altitude in the range of about 200–400 meters, the nylon rod frame with nylon thread wound thereupon and the ballast weight were dropped free-wheeling from the aircraft by declutching the drum. After towing the frame for approximately five minutes, the drum was clutched to the high speed winch and wound up. At the same time, another frame on another winding drum was dropped from the aircraft and this process using alternate drums and collector frames was repeated. Each collector frame was identified as to position upon a predetermined flight pattern or grid to permit subsequent correlation of particle collection results to position of collection upon the pattern or grid.

The collector frames when towed from the aircraft as described, rotate at the end of the towing line and such rotation increases the collection efficiency of the device for airborne mineral particles. Each frame is suitably numbered or otherwise identified and its exposure time and height is correlated with the corresponding position of the aircraft in suitable manner, e.g., as described in the aforesaid U.S. Patent 3,309,518.

## DISCUSSION OF DETAILS

Fine threads are the best collectors for the purposes of the invention to collect airborne microscopic mineral particles at high velocities from aircraft. Such threads may be of spun staple fibers or continuous monofilaments of suitable size. Thinner threads are advantageously used since these provide higher efficiency of collection. The lower limit of the thread size is set by tensile strength of the thread as tensile strength may be controlled by force of the air upon the thread during towing behind an aircraft or force which may be subjected to the thread during the transfer and concentration procedures as described previously. Threads having a size of the order of 0.01 millimeter to 1 millimeter in diameter have been found satisfactory.

Nylon constitutes a suitable synthetic polymer material from which to form fibers, monofilaments or the like to provide collector elements as comprehended by the invention. However, fibers, filaments or the like of any other suitable synthetic polymer material which would be free of contamination from trace elements sought to be detected and analyzed in accordance with the invention may be used. Additional examples of useable fibers include polyester fibers, acrylic fibers, modacrylic fibers, polyolefin fibers and the like. The collection efficiency of the threads or fibers appears, at least in part, to be due to creation of strong static electric charges on the fibers when towed in air at high speeds. Accordingly, use of synthetic polymer materials which provide strong static electric charges in this manner are advantageous.

The analysis with individual particles and of concentrated particles for the identification of their constituent element and for their size distribution can be tedious and costly. For this reason, it is advantageous to eliminate such collected samples of microscopic mineral particles which contain no metallic elements of economic interest. To achieve this, the threads or similar collector elements of the invention are calcined or otherwise ignited or combusted and the very small residues which result contain the mineralized aerosols which can then be quickly analyzed by various techniques of spectrometry or the like and the metallic elements present therein can be detected and determined quantitatively. If there are no trace elements present in a collector sample, then no further detailed analysis is necessary. In this manner, blank samples can be quickly eliminated.



By way of example, a procedure of analysis would involve division of each collector fiber sample into one-half units. One such unit would be calcined and the residue tested for metallic elements by suiitable methods of microanalysis. The other half of the fiber sample could then be used for checking or for detailed analysis where the preliminary microanalysis test indicated this to be desirable or necessary. The quantitative or semi-quantitative values of concentration of metallic elements would then be plotted upon grids or contour maps or as curves after correlating such values with the position of the aircraft.

The shape of such contours and the relative intensity of respective elements would then be used in accordance with the techniques disclosed in U.S. 3,309,518 to locate mineral deposits in the earth's surface, e.g., surface exposures of mineralized rock. If such identifications show sufficient results, the process can be repeated to collect aerosol mineral samples simultaneously at different heights or altitudes. This can be done by clipping a number of collector frames onto loops or other suitable fixtures, to a towing line at desired intervals (see FIGURE 4). In this manner, it is possible to draw contours at various heights above the earth's surface and to draw vertical sections through such contours to locate the source of mineralized aerosol.

## CONCLUSION

New improvements in method of aerial prospecting for mineral deposits in the earth's crust have been described above. These improvements involve the use of threads or similar thread-like elements which are drawn through the air at suitable height above the ground from aircraft following which particles collected by the threads are transferred and concentrated by the simple operation of drawing the threads across a small pad, block or the like. In this manner, concentration of mineral particles for subsequent analysis can be accomplished without recourse to the use of solvents or other liquid operations which, in the past, have lowered the efficiency and increased time and cost in these aerial prospecting operations.

The embodiments of the invention in which an exclusive property or right is claimed are defined as follows:

**1.** In the method of aerial prospecting involving airborne collection of mineral particles, subsequent concentration of the collected particles, analysis of the collected particles, and correlation of the analysis data to geographical position of airborne collection, the improvement which comprises collecting the particles upon a continuous thread of synthetic polymer material.

**2.** A method as claimed in claim **1** wherein said synthetic polymer material is nylon.

**3.** A method as claimed in claim **1** wherein the airborne collection is made by streaming a single nylon thread from an aircraft.

**4.** A method as claimed in claim **1** wherein the airborne collection is made by towing behind and below an aircraft frame across which is stretched a plurality of sections of a thread made of synthetic polymer fiber, said sections being spaced apart from one another.

**5.** A method as claimed in claim **4** wherein the thread subsequent to said towing is unwound from said frame particles thereon are concentrated by drawing the unwound thread across the surface of a body of particle retentive material.

**6.** A method as claimed in claim **1** wherein the thread upon which particles have been collected is drawn across a pad or block of particle retentive material to transfer the particles to said retentive material and effect a concentration of said particles.

**7.** A device for collection of airborne mineral particles comprising a tow line, a ballast weight fastened to